Final Report

A project under the Canada
New Brunswick Conservation
and Renewable Energy
Demonstration Program

Enerplan consultants ltd.
energy planning and engineering

ENERGY CONSERVATION IN FIVE CONVENIENCE STORES NEW BRUNSWICK

46

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CREDA Project # 2042

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Canada/New Brunswick Conservation and Renewable Energy Demonstration Program

The Conservation and Renewable Energy Demonstration Program Program is administered in New Brunswick by the Energy Secretariat and managed jointly with Energy, Mines and Resources Canada. The Program is designed to help demonstrate promising conservation and renewable energy technologies, to develop public awareness and understanding of these technologies, and to create employment in new or existing industries.

Through over 100 demonstration projects in New Brunswick, a wide variety of conservation and renewable energy technologies have proven to be technically sound and economically attractive. These demonstration projects should now provide a catalyst for commercialization and lead to widespread adoption of many of these proven technologies.

This final report is based on a project which was financially supported by the Energy Demonstration Program. For further information on other demonstration projects funded in New Brunswick under this program, contact:

Conservation & Renewable
Energy Division
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Programme Canada/Nouveau-Brunswick de démonstration des économies d'énergie et des énergies renouvelables

Le Programme de démonstration des économies d'énergie et des énergies renouvelables est administré au Nouveau-Brunswick par le Secrétariat à l'énergie, en collaboration avec Energie, Mines et Ressources Canada. Ce programme tente d'abord de vérifier la fiabilité des techniques de conservation d'énergie, d'accroître la sensibilité du public envers ces techniques et, enfin, de favoriser la création d'emplois au sein des industries nouvelles ou déjà existantes.

Un grand nombre de projets de démonstration se sont avérés à la fois techniquement réalisables et économiquement attrayants.

Le succès ainsi rencontré encourage la commercialisation des procédés les plus accessibles. Cela entraînerait certes l'adoption d'un grand nombre de ces techniques par les propriétaires de domiciles et par l'industrie privée.

Ce rapport final est basé sur un projet qui a reçu une aide financière du Programme de démonstration. Pour de plus amples renseignements, communiquez avec la:

Division des économies d'énergie
et des énergies renouvelables
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D E N I D E R E S P O N S A B I L I T E

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1.0 EXECUTIVE SUMMARY

Energy Conservation in Convenience Stores is the title of a demonstration project on five small variety stores located in various centres throughout the province. Retrofits in these stores concentrated on the following:

1) improvements to the building envelope by insulating and air sealing with caulking and weatherstripping,
2) improvements to lighting by replacement of old types of lamps with new more efficient lamps.
3) heat reclaim of some of the heat rejected by the freezers and cooler units.
4) improvements to the space heating and cooling systems by replacement of old systems with new more efficient systems.

The projects demonstrated that the modern technologies applied to these stores are readily adaptable and suitable to this type of application. Cost feasibility is dependent on the size and condition of the store before retrofit, but in all cases the analysis for retrofit is well worth considering.

1.0 SOMMAIRE RECOMMANDATION

"Economie de l'énergie dans les épiceries de dépannage" est le titre d'un projet de démonstration touchant cinq dépanneurs situés à divers endroits dans la province. Les travaux de rattrapage comportaient principalement:

1) l'amélioration de l'enveloppe du bâtiment en l'isolant et en la rendant étanche à l'air par le calfeutrage et l'installation de coupe-bise;

2) l'amélioration de l'éclairage en replaçant l'ancien système par des appareils plus efficaces;

3) la récupération d'une partie de la chaleur rejetée par les congélateurs et les réfrigérateurs;

4) l'amélioration des systèmes de chauffage et de refroidissement des locaux par les remplacement des anciennes installations par de nouveaux appareils plus efficaces.

Les diverses applications de ce projet ont démontré que les technologies modernes utilisées dans ces dépanneurs sont faciles à adapter et conviennent à ce genre d'utilisation. La faisabilité financière dépend des dimensions et de l'état du magasin avant les travaux, mais quoi qu'il en soit, il vaut vraiment la peine de procéder à une analyse préliminaire.

2.0 INTRODUCTION

2.1 General

Convenience stores have increased in number and importance in a society demanding more flexible shopping hours along with more accessible shopping locations. Unfortunately, the cost of operating a small variety store has increased substantially in part due to the rising costs of energy. Stores must be operated very efficiently in order to remain competitive in a highly competitive market. The objective of this project is to show that stores with pre-oil crisis technology can be retrofitted with modern technology by financially feasible methods.

Enerplan Consultants Ltd. prepared and submitted a proposal for an energy conservation retrofit demonstration project on five convenience stores considered typical of those in New Brunswick. The stores were:

1) **Boldon's Variety, Fredericton**
2) **Elliott Brother's Convenience Store, St. John**
3) **Long's Variety Store, Riverview**
4) **Sunshine Foods Ltd., Fredericton**
5) **5 O'H's Variety, Moncton**

2.0 INTRODUCTION (Cont'd)

2.1 General (Cont'd)

The proposal was accepted for funding by the Energy Secretariat under the Conservation and Renewable Energy Demonstration Agreement in April 1982.

Capital investment per store was estimated to be **$26,000.00** and savings were estimated to be **$3,100.00** per year for a simple payback of **8.5** years.

2.0 INTRODUCTION (Cont'd)

2.2 Site Selection

With the large number of corner stores in the Province, some guide lines were followed for site selection. The criteria used were as listed below:

1) geographical location
2) population of the community
3) type of fuel consumed
4) owner's ability for contribution
5) applicability for retrofit demonstration

3.0 DESCRIPTION OF DEMONSTRATION

3.1 General

The energy consumption in a corner store can be divided into the following divisions.

1) Space heating & cooling
2) Lighting
3) Refrigeration
4) Miscellaneous

Preliminary monitoring undertaken on the selected sites indicated that the energy consumed can be distributed as shown below:

Space heating & cooling	-	**45% to 60%**
Lighting	-	**20% to 25%**
Refrigeration	-	**20% to 25%**
Miscellaneous	-	**1% to 5%**

3.0 DESCRIPTION OF DEMONSTRATION (Cont'd)

3.2 Space Heating and Cooling

The distribution of energy consumption in a typical variety store illustrates that approximately 40 to 50% of the required energy input is for lighting and refrigeration equipment, both of which produce waste heat and are constant loads during the hours of store operation. This results in a cooling requirement for the space the majority of the time.

Space heating is required during the colder winter months and during unoccupied hours. To maximize the efficiency of heating (and cooling), it is essential that the building envelope be tight, well insulated, that waste heat be utilized where possible, and that the heating/cooling system be energy efficient, properly operated and maintained.

The majority of small commercial stores in the Province of New Brunswick are heated by means of hot water radiation or warm air systems, usually fired with light oil. Air conditioning is normally provided by thru-the-wall units which were installed as a result of lighting and refrigeration equipment being added and rejecting the waste heat to the space. In many cases, the refrigeration equipment consists of self-contained coolers, supplied by food and beverage wholesalers, with air-cooled compressors.

3.0 DESCRIPTION OF DEMONSTRATION (Cont'd)

3.2 Space Heating and Cooling (Cont'd)

The heating and cooling systems are normally each provided with separate thermostatic control and interfacing between the two is non-existant.

3.3 Lighting

Lighting in the small commercial establishments has been upgraded in recent years with installation of strip fluorescent fixtures. Lighting levels are, in many cases, too high by today's standards; however it is generally accepted that high light levels are conducive to higher sales. This analogy is not true in the small commercial marketplace but is extremely difficult to change with store owners. The demonstration projects selected all have fluorescent lighting on the interior and except for one, have lighting levels higher than required.

Exterior lighting in most cases consists of incandescent fixtures and 'dusk-to-dawn' type rental fixtures.

Lighting technology has advanced quickly in the last decade and efficiencies of various types of light sources have increased drastically. A chart illustrating efficiencies of various light sources is shown in Appendix "A".

3.0 DESCRIPTION OF DEMONSTRATION (Cont'd)

3.4 Refrigeration

Most small commercial stores have a number of coolers/ freezers for their products. The majority of this equipment is supplied by food and beverage wholesalers and suppliers and consists of a display case with a built-in refrigeration system. The compressors are either air or water cooled and are located within the individual cooler or freezer unit.

With the growth of the small commercial market, store owners have simply kept adding refrigeration equipment without considering the impact on energy efficiency or consumption.

3.0 DESCRIPTION OF DEMONSTRATION (Cont'd)

3.5 Retrofits

3.5.1 Architectural

(a) General

The exterior building envelopes of the stores selected were generally poorly insulated and had high rates of air infiltration. Doors and windows were also of poor quality in most cases.

(b) Exterior Walls and Roofs

Long's Variety in Riverview, NB is typical of newer construction (1970's) and consists of concrete block walls, uninsulated, and a flat tar and gravel roof on a metal deck. The walls were insulated on interior with rigid fiberglass insulation RSI-3.5 (R20), 6 mil vapor barrier and gypsum board. The roof was considered for replacement; however, financial resources were not available.

Five O'H's store in Moncton, NB, an older structure has wood frame walls with masonite siding. The sloped roof consists of asphalt shingles on plywood. The retrofit consisted of upgrading insulation levels with blown-in cellulose insulation in the wall cavities and the attic space. The resultant values were RSI-2.6 (R15) for the walls and RSI-5.2 (R30) for the roof area.

3.0 DESCRIPTION OF DEMONSTRATION (Cont'd)

3.5 Retrofits

3.5.1 Architectural

(b) Exterior Walls and Roofs (Cont'd)

Elliot Brothers store in Saint John, NB is an old wooden-framed structure with minimal insulation and excessive air leakage. Insulation voids in the walls were detected and filled with cellulose insulation; new vinyl siding with 3.8cm (1½in.) of fiberglass insulation board was installed on the exterior of the building.

(c) Doors and Windows

Windows were replaced with new double-glazed units in a few of the stores; new entrance doors and vestibules were added and excessive glass was eliminated in some areas. The entrance doors installed were metal-framed, insulated units with heavy duty closures and weatherstripping.

(d) Air Infiltration

In an attempt to reduce the excessive air infiltration rates, all of the facilities were extensively tested and a detailed air sealing program was undertaken. The company employed was a specialist in air sealing techniques and air infiltration was greatly reduced in all cases. Test results are included as an Appendix.

3.0 DESCRIPTION OF DEMONSTRATION (Cont'd)

3.5 Retrofits

3.5.2 Lighting

The lighting systems were not extensively retrofitted. Interior lighting levels could not be changed, in most cases; however, energy efficient tubes and ballasts were installed where possible. The exterior lighting was improved by utilizing high pressure sodium fixtures controlled by photo cells and time clocks.

3.5.3 Space Heating and Cooling

(a) General

New heating and cooling systems were installed in four of the buildings selected. The systems were selected based upon the following criteria:

- operating efficiencies
- initial capital costs
- capability of utilizing waste heat
- ease of operation and maintenance
- reliability

In all cases, it was decided to install air/air heat pump systems with electric coil back-up.

3.0 DESCRIPTION OF DEMONSTRATION (Cont'd)

3.5 Retrofits

3.5.3 Space Heating and Cooling

(b) Heat Pump Systems

The systems installed consisted of an air/air heat pump, distribution ductwork and associated controls. Waste heat from the air-cooled refrigeration compressors was utilized for space heating and exhausted during the cooling season. Supplemental heat is provided by an electric duct heater. A schematic of the systems is shown in the appendices.

During the first full year of operation, the heat pumps have operated well and provided trouble-free service. The building owners are well satisfied with their performance and overall energy efficiency.

4.0 PERFORMANCE OF SYSTEM

4.1 Metering and Monitoring

The proposal suggested that individual meters were to be installed for the various users of energy in each of the selected sites; however, due to the cost and the questionable value of such detailed metered information, it was decided to delete the permanent metering. Portable metering equipment was used to determine trends in electrical consumption in the stores, and the actual fuel oil and electrical consumptions, both before and after retrofit, were assembled and used to analyze the project results.

Only four of the five stores were considered good examples for comparison of before and after retrofit data. Elliott Brothers store was expanded during the monitoring period and energy consumption does not reflect changes due to retrofit alone.

Complete energy data for before retrofit was not available from Bolden's Variety Store. It was necessary to assume that electricity consumption from July to November inclusive was similar to other months with similar degree days.

Complete energy data for after retrofit was not available for Sunshine Foods Ltd. since sufficient time has not yet lapsed.

4.0 PERFORMANCE OF SYSTEM

4.2 Technical Performance

4.2.1 General

The equipment installed and the retrofits completed have performed well during the first twelve months of operation and have accomplished their expected objectives.

4.2.2 Lighting

The lighting fixtures installed on the exterior were high pressure sodium type and were selected for their energy efficiency. They have performed well with no problems and are very satisfactory.

4.2.3 Space Heating & Cooling Systems

The heat pump systems have all operated very well and have been trouble-free. The exact savings cannot be accurately determined because of the type of system replaced; however, the efficiency has proven to be as expected.

4.2.4 Architectural Retrofits

The air sealing, insulation upgrading and air lock entries have proven to be beneficial in terms of energy consumption. Though difficult to measure exactly, it is apparent that these measures are cost effective and should be considered top priority in any general retrofit project.

4.0 PERFORMANCE OF SYSTEM

4.2 Technical Performance

4.2.5 Energy Monitoring Results

Bolden's Variety Store decreased consumption from 68.8 equivalent kilowatt hours per square foot (EkWh/ft.^{2}) to 59.3 EkWh/ft.^{2} a reduction of 13.7 per cent. Although degree day data for comparative years is not the same, the variation in energy savings is considered to be less than 3 per cent from year to year. Exact years could not be compared due to lack of before retrofit data. Area assumed is 3300 square feet.

Long's Variety decreased consumption from 53.8 EkWh/ft.^{2} to 53.7 EkWh/ft.^{2}, a reduction of 0.2 per cent, which implies no significant change. Area assumed is 2340 square feet.

Five O'H's decreased consumption from 34.8 EkWh/ft.^{2} to 23.4 EkWh/ft.^{2}, a reduction of 32.7 per cent. Area assumed is 3400 square feet.

Sunshine Foods Ltd. decreased consumption from 50.3 EkWh/ft.^{2} to 47.9 EkWh/ft.^{2}, a reduction of 4.8 per cent. This is based on projected figures.

Details of energy consumption analysis can be seen in the appendices.

4.0 PERFORMANCE OF SYSTEM

4.2 Technical Performance

4.2.6 Air Sealing Results

Before and after air leakage tests were performed on Elliott Brothers' Store and the Five O'H's Store. A reduction of infiltration of 62.9 per cent was achieved at Elliott Brothers and a reduction of 55 per cent was achieved at the Five O'H's.

Details and descriptions on air sealing can be found in the appendices.

4.2.7 Degree Day Normalization

Sufficient data is available for only two of the five stores to do degree day normalization. Exact times of switchover from heating mode to cooling mode are not available since modes switched back and forth several times in Spring and Fall as the time of the day changed. Therefore, this consultant feels that great care must be taken to establish actual heating periods and cooling periods before using degree day data as a relevant analysis. The equivalent kilowatt hours per square foot are considered adequately significant for this report.

5.0 PROJECT COST ACCOUNTING

5.1 Cost Breakdown

The cost breakdown for this project is listed below:

Energy Retrofits	$114,490.00
Monitoring Equipment	$ 11,250.00
Engineering and Performance Monitoring	$ 33,150.00
Information Transfer	$ 5,000.00
Disbursements	$ 4,900.00
Final Report	$ 1,500.00
Project Total	$170,290.00
CREDA FUNDING	$132,180.00
Store Owner's Contribution	$ 38,210.00
	$170,290.00

5.2 Cost Analysis

Bolden's Variety decreased costs (based on rates in January 1985) from $13,837 to $12,342 per year, a reduction of 10.8 per cent.

Long's Variety decreased costs from $8,582 to $8,556, a reduction of 0.3 per cent.

Five O'H's decreased costs from $7,473 to $5,946, a reduction of 20.4 per cent.

Sunshine Foods Ltd. decreased costs from $13,110 to $12,120, a reduction of 7.6 per cent.

Detailed costs breakdown can be found in the appendices.

5.0 PROJECT COST ACCOUNTING

5.2 Cost Analysis (Cont'd)

The cost analysis of the corner stores cannot be done fairly with just a simple payback period. The store owners not only realized a savings in energy costs but they also improved the comfort conditions. The benefits are:

(1) that the employees are more comfortable

(2) a store that maintains proper environmental conditions is apt to attract more customers

(3) the rate of spoilage and less of goods will be lower.

6.0 INFORMATION TRANSFER

6.1 General

The variety store retrofit program has been well received by the store owners and any interested persons have been informed of the program and its results. Project signs were displayed for approximately one year on all five sites and, with the number of people who frequent variety stores, the exposure was extensive.

A display featuring the variety stores was presented at the "Municipal Energy Conference" in November, 1984 held in Fredericton, N. B.

7.0 RECOMMENDATIONS AND CONCLUSIONS

The primary objective of the project, which was to improve the energy efficiency of the five corner stores, was achieved satisfactorily.

The application of air/air heat pumps for small commercial buildings is indeed a good one and should be encouraged.

Air sealing, upgrading insulation levels, and addition of air-lock vestibules all contributed to energy efficiency and should be considered for similar retrofits.

The utilization of waste heat from the refrigeration compressors proved beneficial.

High pressure sodium exterior lighting is efficient, attractive and cost-effective.

APPENDIX "A"

EFFICIENCY OF LIGHT SOURCE

APPENDIX A

EFFICIENCY OF LIGHT SOURCES

LIGHT SOURCE	LAMP WATTAGE	BALLAST WATTAGE	LUMENS	RATED LAMP LIFE	LUMENS/ WATT
Incandescent	300	-	6,000	1,000	20
	500	-	9,900	1,000	20
	1000	-	23,300	1,000	23
Flourescent	40 CW	8	3,150	20,000	65
	40 WW	8	3,200	20,000	66
	75 CW	15	6,300	12,000	70
Mercury	250	35	11,050	24,000	39
	400	50	20,880	24,000	46
Metal Halide	175	40	14,000	7,500	65
	400	50	34,000	15,000	76
High Pressure Sodium	100	16	9,500	20,000	82
	250	53	26,600	24,000	88
	400	75	50,000	24,000	105
Low Pressure Sodium	35	8	4,800	18,000	112
	90	18	13,500	18,000	125
	180	36	33,000	18,000	153

APPENDIX "B"

AIR SEALING RESULTS

AIR LEAKAGE CONTROL TEST REPORT

IDENTIFICATION

- CLIENT Elliot Bros. Ltd.
- ADDRESS 41 Lock Lomand Rd.
  St. John, NB
- PHONE (H) _____ (W) 652-2803
- TECHNICIAN McGrattan

BUILDING DESCRIPTION

- APPROX. CONSTRUCTION DATE: Pre-war
- BASEMENT? ☐ YES ☐ NO ☒ PARTIAL
- VENTILATION SYSTEM ☐ NONE Kitchen Exhaust
- INTERIOR HEATED VOLUME N/A m³/ft²
- EXTERIOR ENVELOPE AREA _____ m²/ft²
- HOUSE STYLE ☐ 1 STOREY ☐ 1 1/2 ☒ 2
- ☐ 2 1/2 ☐ 3 ☐ SPLIT-LEVEL ☐ BI-LEVEL

BEFORE

PRE-RETROFIT TEST

☐ NEW HOUSE ☐ RESEARCH

- DATE 07/11/83 TIME 13:15 AM PM
- TEMPERATURE: IN 19 ° OUT 23 °
- WIND (VEL. AND DIR.) Calm
- STATION PRESSURE 101.3 Kpa/mbar

PRESSURE PA	FLOW ☐ l/s ☐ cfm
60	112	900
55		
50	102	810
45		
40	91	720
35		
30	80	659
25		
20	66	543
15		
10	45	348

N = 0.512
C = 111.00
COR = 99.46 %
SLA _____ cm²/m² / 99.46 in²/100ft²
SQ. CM 1400
ELA SQ. FT. _____
AIR CHANGES/HR @ 50 pa: 34.19

AFTER

POST-RETROFIT TEST

☐ NEW HOUSE ☐ RESEARCH

- DATE 12/02/83 TIME 15:20 AM PM
- TEMPERATURE: IN 5 ° OUT 1 °
- WIND (VEL. AND DIR.) 15 km wsw
- STATION PRESSURE 101.5 Kpa/mbar

PRESSURE PA	FLOW ☐ l/s ☐ cfm
60	133	536
55		
50	101	466
45		
40	71	390
35		
30	43	303
25		
20	23	220
15		
10		

N = 0.815
C = 19.125
COR = 99.975 %
SLA _____ m²/m² / _____ in²/100ft²
SQ. CM 520
ELA SQ. FT. .56
AIR CHANGES/HR @ 50 pa: 19.232

HOUSE CONDITION

• VENTS	☐ OPEN	☒ SEALED
• FIREPLACE N/A	☐ OPEN ☐ SEALED	☐ CLOSED ☐ BLOCKED
• FURNACE	☐ OPEN	☒ SEALED

RETROFIT RESULTS

EQUIVALENT LEAKAGE AREA (ELA)

BEFORE .14M² AFTER .052

62.9 % REDUCTION ACHIEVED

COMMENTS: Because of the nature of this building, one area (the Sports shop) was singled out for an after test. I believe the reduction in the store/restaurant would be in the range of 30% - 40%. The owners have commented that they are amazed at how little fuel has been used to date!

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AIR LEAKAGE TEST REPORT

IDENTIFICATION

- CLIENT ENERPLAN CONSULTANTS LTD.
- ADDRESS 188 GORDON STREET
  MONCTON, N.B.
- PHONE (H) 388-4670 (W) 854-5536
- TECHNICIAN HOLT

BUILDING DESCRIPTION

- APPROX. CONSTRUCTION DATE: _____
- BASEMENT? [X] YES [ ] NO [ ] PARTIAL
- VENTILATION SYSTEM [ ] NONE Heat Pump
- INTERIOR HEATED VOLUME 990 m^3
- HOUSE STYLE [ ] 1 STOREY [ ] 1 1/2 [ ] 2 [ ] 2 1/2 [ ] 3 [ ] SPLIT-LEVEL [ ] BI-LEVEL

BEFORE

PRE-RETROFIT TEST

[ ] NEW HOUSE [ ] RESEARCH

- DATE 4 AUG 82 TIME 10:00 AM PM
- TEMPERATURE: IN 22 °C OUT 13 °C
- WIND (VEL. AND DIR.) CALM
- AIR PRESSURE 101.3 Kpa

PRESSURE (PA)	FLOW (l/s)
60	
55	
50	
45	
40	2.334
35	2.220
30	2.091
25	
20	
15	
10	1.37

N = 0.381
C = 0.572
COR = 0.9999

ELA SQ. CM 550
SQ. FT. 5.9

AIR CHANGES/HR @ 50 pa: 9.23

AFTER

POST—RETROFIT TEST

[ ] NEW HOUSE [ ] RESEARCH

- DATE 10 MAY 83 TIME 10:00 AM PM
- TEMPERATURE: IN 22 °C OUT 10 °C
- WIND (VEL. AND DIR.) CALM
- AIR PRESSURE 100.2 Kpa

PRESSURE (PA)	FLOW (l/s)
60	1.83
55	
50	1.68
45	
40	1.411
35	
30	1.243
25	
20	0.982
15	
10	0.628

N = 0.596
C = 0.161
COR = 0.9987

ELA SQ. CM 250
SQ. FT. 2.69

AIR CHANGES/HR @ 50 pa: 7.34

HOUSE CONDITION

- VENTS [ ] OPEN [ ] SEALED
- FIREPLACE [ ] CLOSED [ ] BLOCKED [ ] SEALED
- FURNACE [ ] OPEN [ ] SEALED

RETROFIT RESULTS

EQUIVALENT LEAKAGE AREA (ELA)

BEFORE 0.55 m^2 AFTER 0.25 m^2

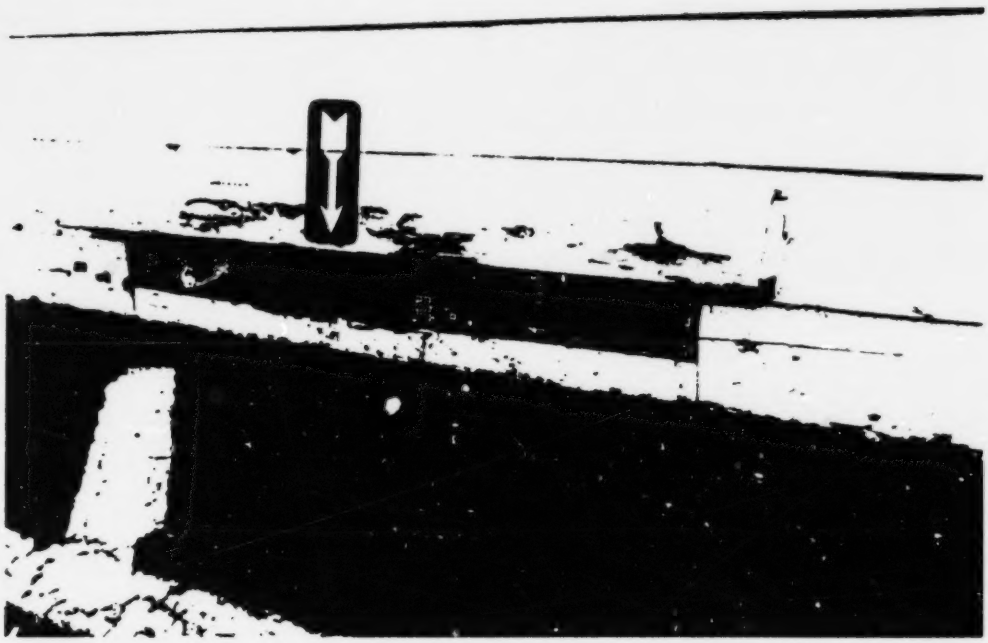
55 % REDUCTION ACHIEVED

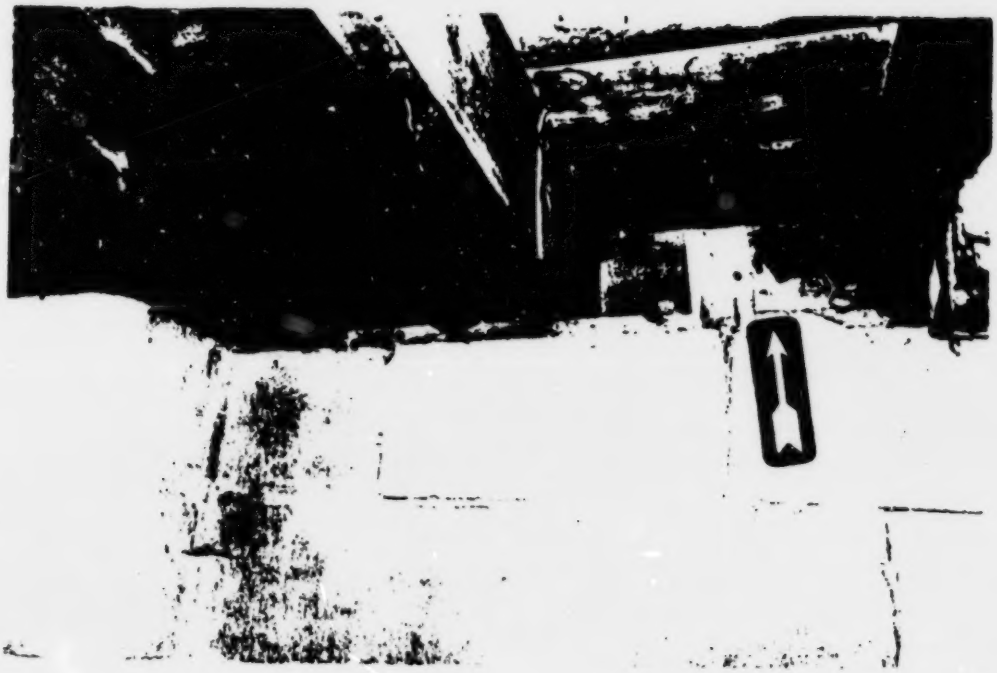
COMMENTS:

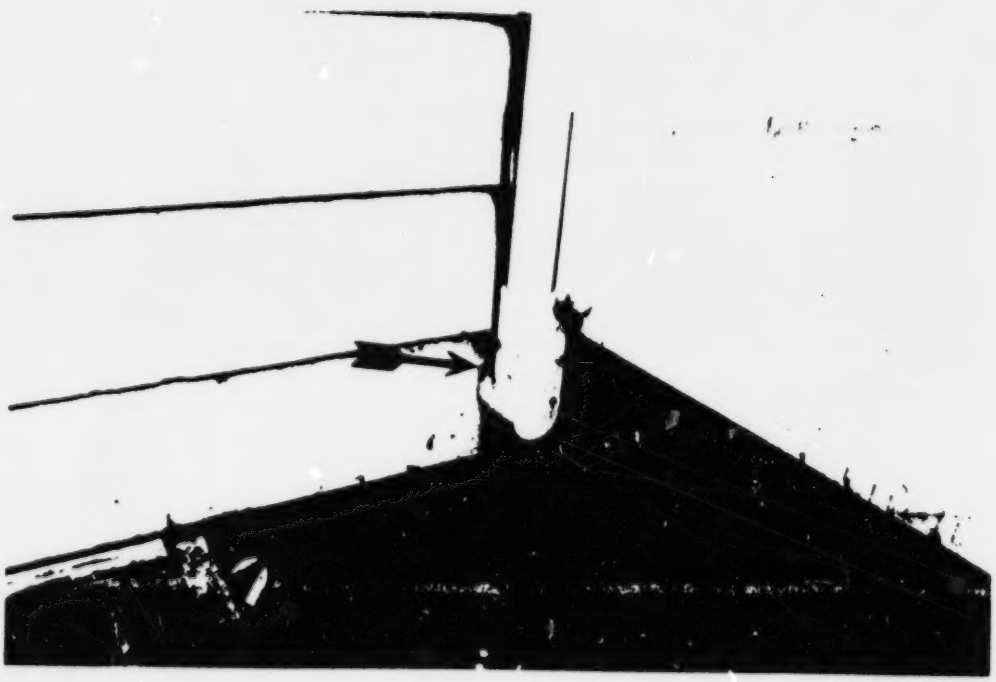
The 5 OH's corner store was retrofitted for air leakage and the oil-fired furnace was removed. All penetrations were sealed and/or blocked off.

RETROTEC 1982

PHOTO REPORT: BOCDONS







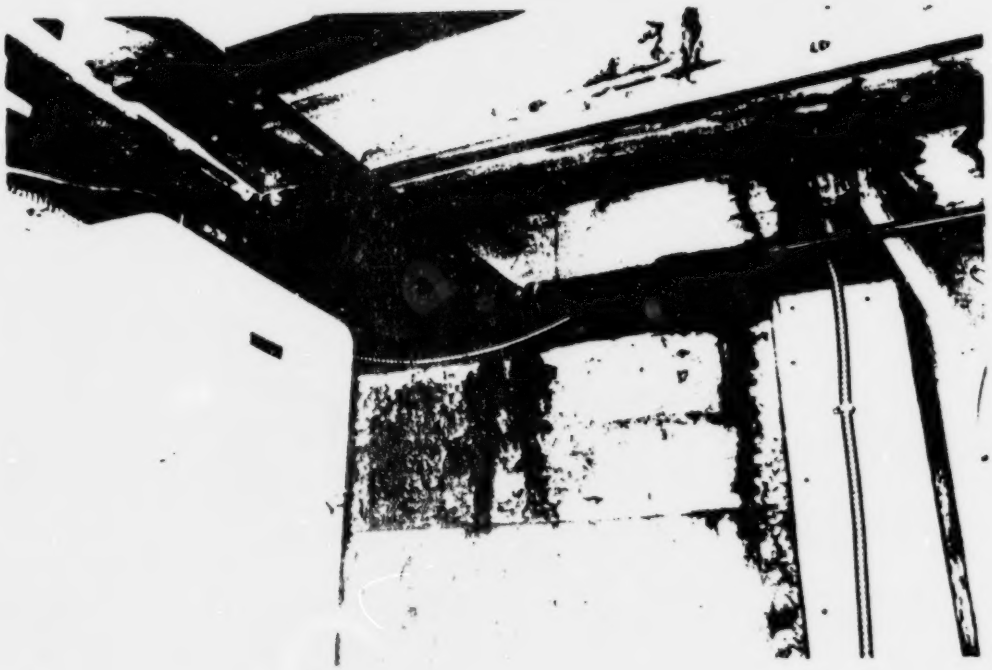
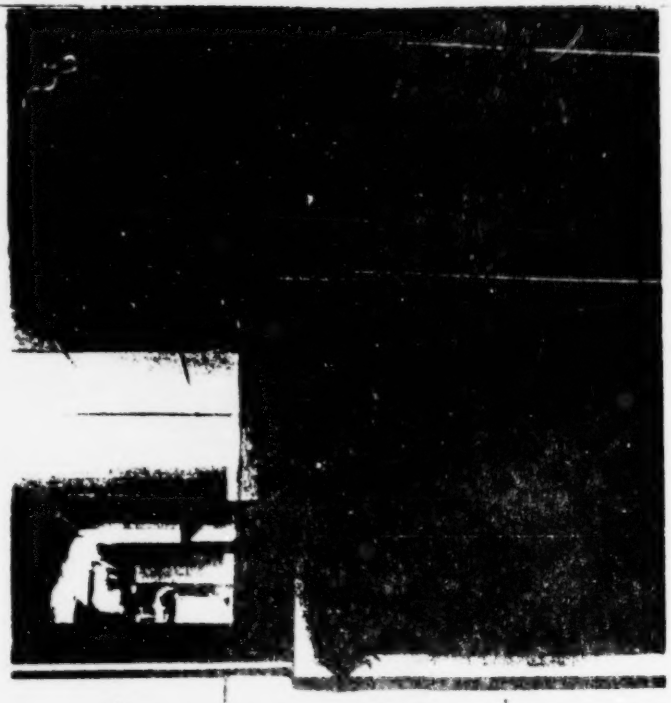
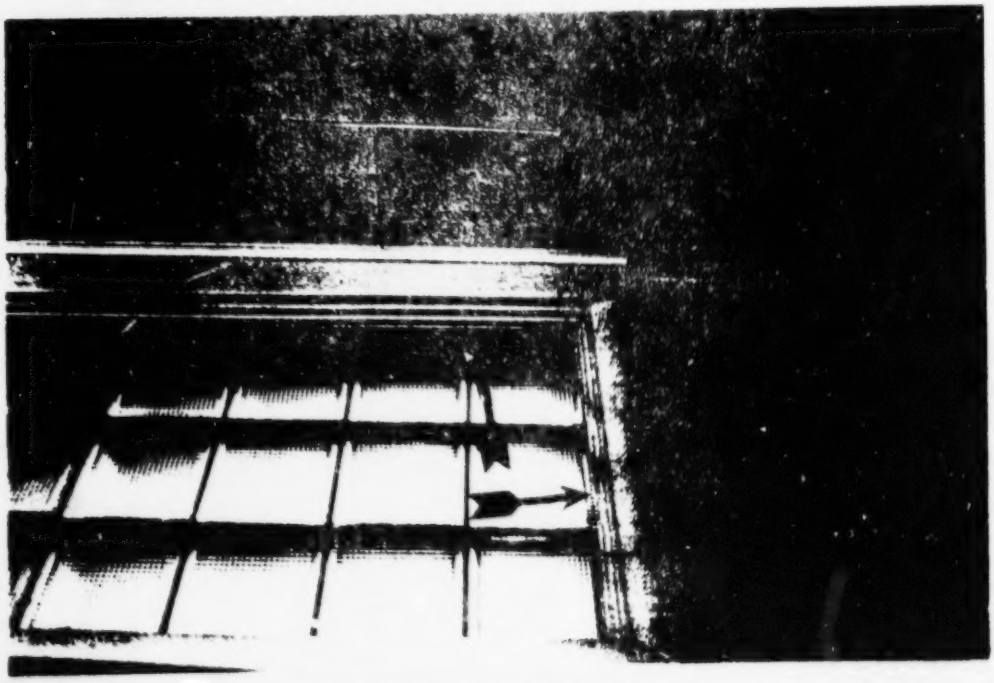


PHOTO REPORT: BOLDONI

Page 4





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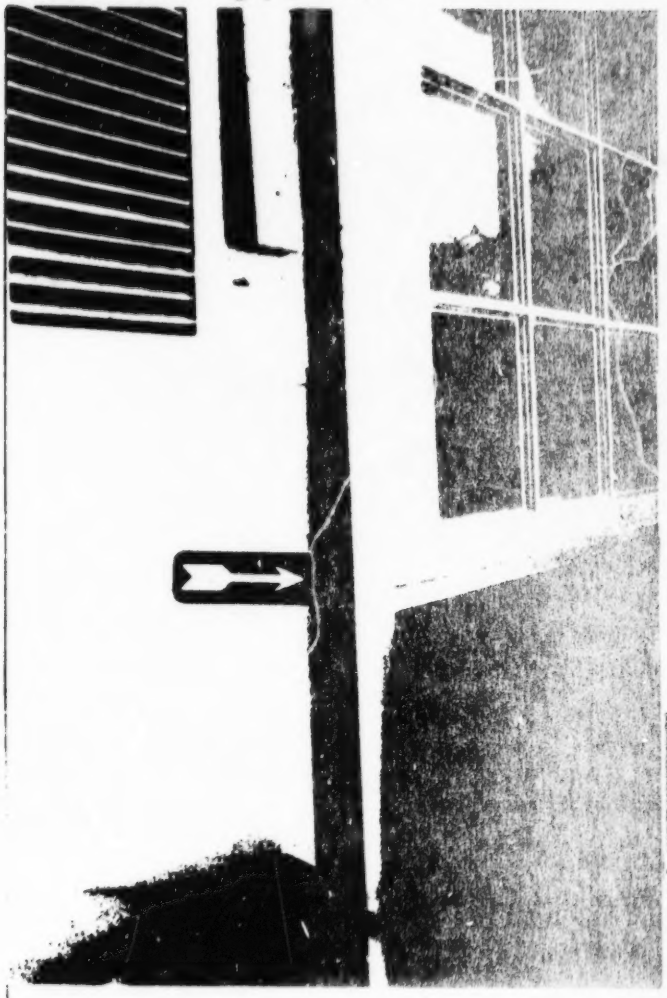


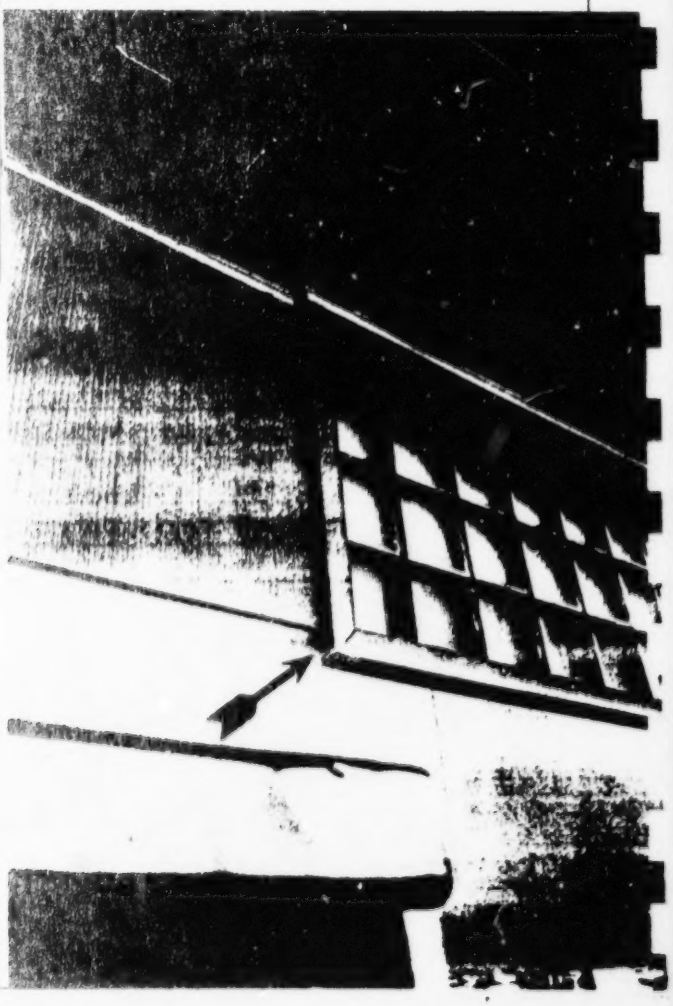
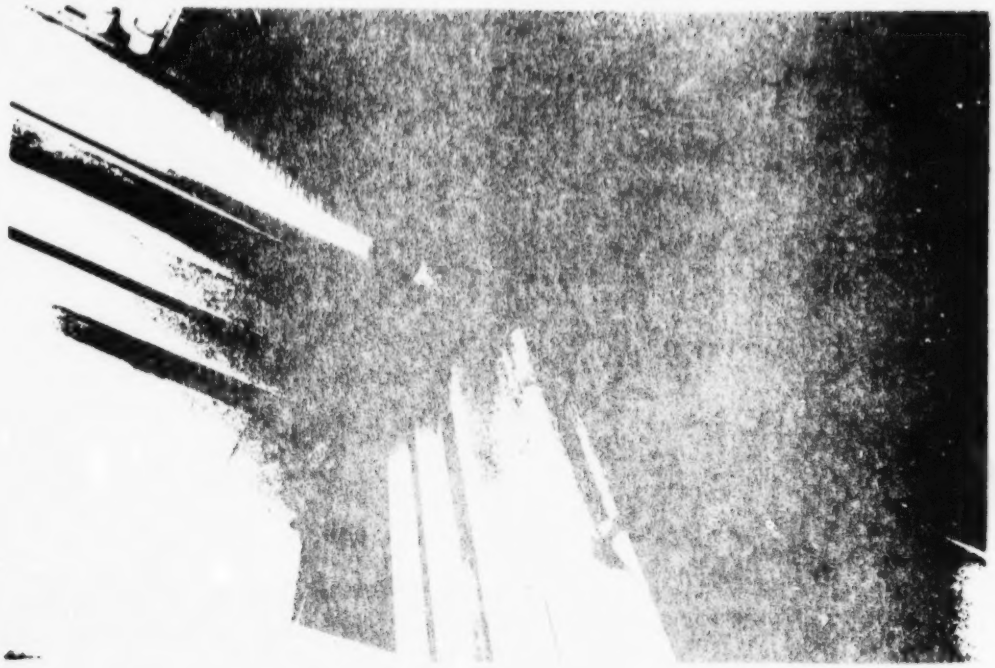


PHOTO REPORT: BOLDONS

page 6



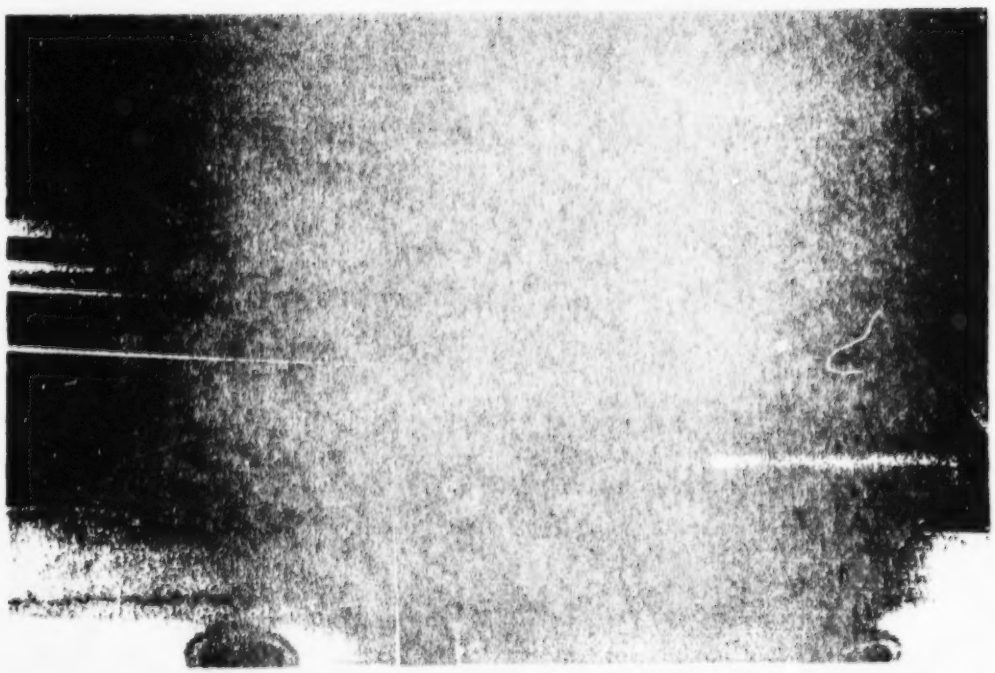


PHOTO REPORT

PHOTO REPORT

PHOTO REPORT:

APPENDIX "C"

THERMOGRAPHY SURVEY

INFRARED THERMOGRAPHY SURVEY
OF
5 O'H's VARIETY STORE
OLD SHEDIAC ROAD
MONCTON, NB

by

ENERTEK LIMITED
P.O. BOX 1
FREDERICTON, NB

November 1, 1982

Dale F. O'Brien, CET

GENERAL

An exterior infrared thermography survey of the 5 O'H's Variety Store located on the Old Shediac Road was conducted on October 7, 1982. The purpose of the survey was to identify any major thermal anomalies in the building envelope.

Following is the environmental conditions during the survey.

Ambient Temperature $10^{o}C$.

Wind Speed Moderate

CONCLUSIONS

Due to the type of survey conducted (exterior) and the weather conditions encountered during the survey, it was not possible to obtain detailed information on the building envelope.

The following significant thermal anomalies, however, were identified and are listed in order of importance.

1) Foundation wall heat loss. (See all thermograms)
2) Exfiltration at roof/wall edge. (See thermograms 1 - 3 and 1 - 4)
3) Heat loss through single glazed main entrance. (See thermogram 1 - 1)
4) Possible missing wall insulation. (See thermograms 2 - 4)

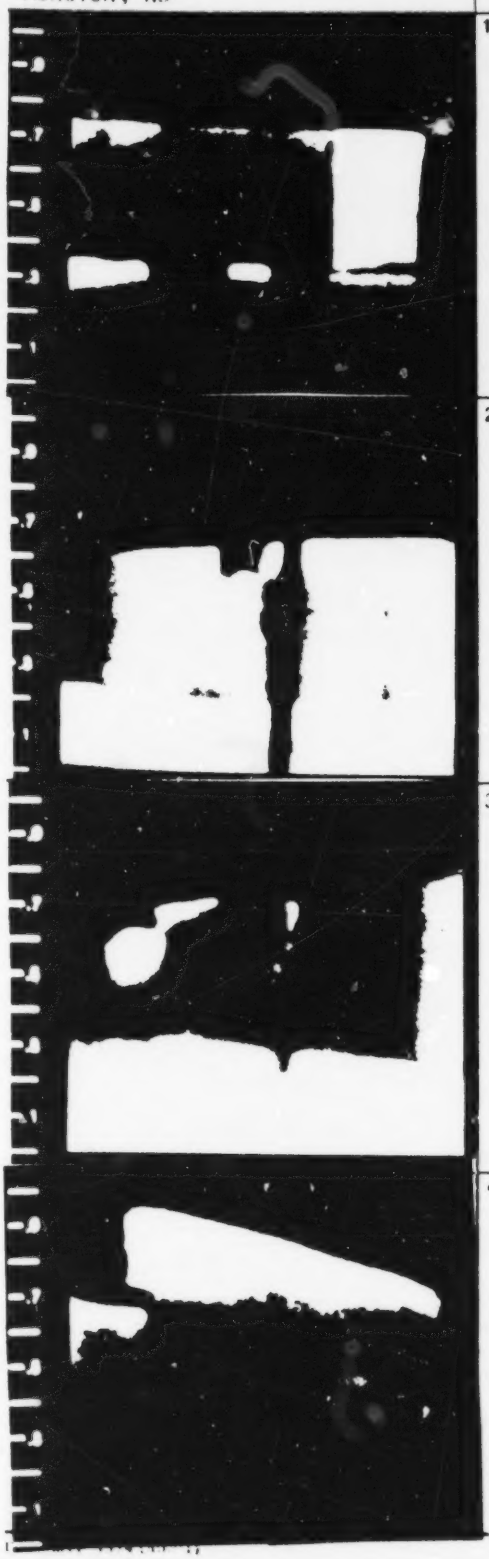
THERMOGRAPHIC INVESTIGATION
DATA SHEET

PAGE 1

ENERGY CONSERVATION LIMITED

PROJECT
MONCTON, NB

BUILDING/COMPLEXE
5 O'H's Variety Store



1

DATE: 82-10-07 | HOUR/HEURE: 2:30 | T_o/T_e: 20°

WING / BÂTIMENT:

WALL / FAÇADE: South

SECTOR / SECTION:

DETAILS / ÉLÉMENT: Exterior

T_i: | T_o/T_e: 10°C | RH_i/HR_i: | RH_o/HR_e:

NOTES
Heat loss is noted through foundation wall and single glazed entrance. Refer to photograph 1(A)

2

DATE: 82-10-07 | HOUR/HEURE: 2:35 | T_o/T_e: 20°

WING / BÂTIMENT:

WALL / FAÇADE: West

SECTOR / SECTION: South West

DETAILS / ÉLÉMENT: Exterior

T_i: | T_o/T_e: 10°C. | RH_i/HR_i: | RH_o/HR_e:

NOTES
Heat loss through the foundation wall is the most significant thermal anomaly identified in this thermogram. Refer to photgraph 1(B)

3

DATE: 82-10-07 | HOUR/HEURE: 2:40 | T_o/T_e: 20°

WING / BÂTIMENT:

WALL / FAÇADE: West

SECTOR / SECTION: North West

DETAILS / ÉLÉMENT: Exterior

T_i: | T_o/T_e: 10°C. | RH_i/HR_i: | RH_o/HR_e:

NOTES
Excessive exfiltration is observed along the roof/wall edge plus heat loss through the foundation wall. Refer to photograph 1(B)

4

DATE: 82-10-07 | HOUR/HEURE: 2:45 | T_o/T_e: 20°

WING / BÂTIMENT:

WALL / FAÇADE: West

SECTOR / SECTION: North West

DETAILS / ÉLÉMENT: Exterior

T_i: | T_o/T_e: 10°C | RH_i/HR_i: | RH_o/HR_e:

NOTES
Close up of exfiltration problem noted in thermogram 1-3

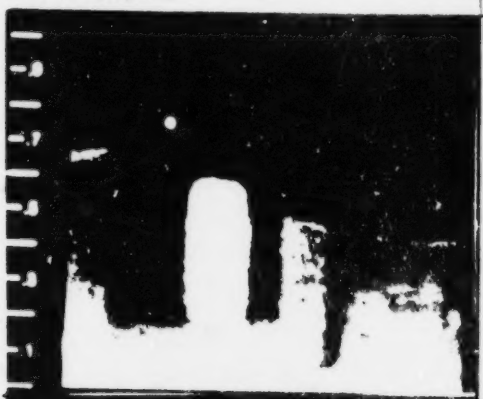
THERMOGRAPHIC INVESTIGATION
DATA SHEET

PAGE 2

ENGLISH LIMITED

JOB/PROJET
MONCTON, NB

BUILDING/COMPLEXE
5 O'H's Variety Store



1

DATE: 82-10-07 | HOUR/HEURE: 2:50 | 20°

WING/BÂTIMENT:

FLOOR/SECTION:

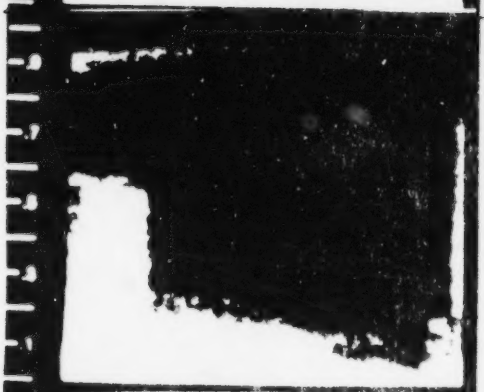
WALL/FAÇADE: North

DETAILS/ÉLÉMENT: Exterior

T_i: | T_o/T_p: 10°C.

NOTES:

Heat loss through the door and foundation wall are significant in this thermogram. Refer to photograph 2(A)



2

DATE: 82-10-07 | HOUR/HEURE: 2:55 | 20°

WING/BÂTIMENT:

WALL/FAÇADE: East

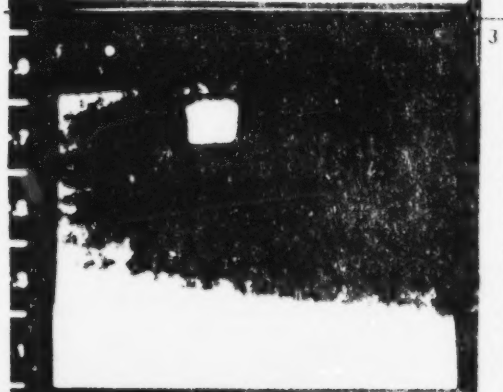
FLOOR/SECTION: North East

DETAILS/ÉLÉMENT: Exterior

T_i: | T_o/T_p: 10°C

NOTES:

Heat loss through the door and foundation wall are significant in this thermogram. Refer to photograph 2(B)



3

DATE: 82-10-07 | HOUR/HEURE: 3:00 | 20°

WING/BÂTIMENT:

WALL/FAÇADE: East

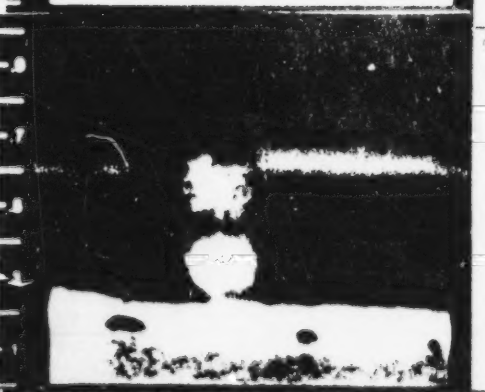
FLOOR/SECTION:

DETAILS/ÉLÉMENT: Exterior

T_i: | T_o/T_p: 10°C.

NOTES:

White (warm) rectangular area is a window. High heat loss is also noted through the foundation wall. Refer to photograph 2(B)



4

DATE: 82-10-07 | HOUR/HEURE: 3:05 | 20°

WING/BÂTIMENT:

WALL/FAÇADE: East

FLOOR/SECTION: South East

DETAILS/ÉLÉMENT: Exterior

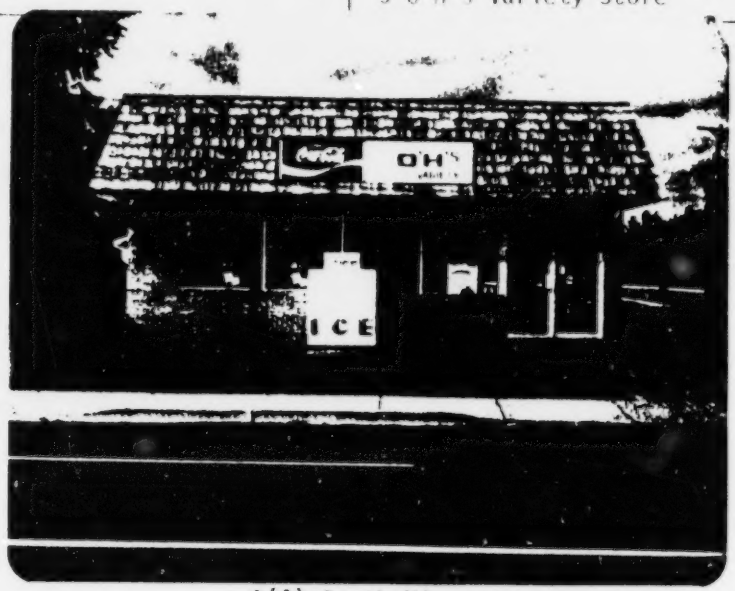
T_i: | T_o/T_p: 10°C

NOTES:

Thermogram reveals probable missing insulation plus heat loss through the foundation wall. Refer to photograph 2(B)

CFORMTP 1573 (80/11)

CITY: Moncton, NB	BUILDING: 5 O'H's Variety Store



1(A) South View

1(B) West View

Moncton, NB	5 O'H's Variety Store

2(A) North View

2(B) East View

APPENDIX "D"

TYPICAL HEAT PUMP SYSTEM

ACCESSORIES FOR FIELD INSTALLATION

PRECHARGED INTERCONNECTING TUBING – 15, 25, 30 and 35 foot lengths of copper tubing. All indoor vapor ends are provided with a 90° bend except the 30 foot line which is straight. The 30 foot line is intended for splicing to other lines to make available lengths of 15, 25, 35, 45, 55 and 65 feet. Vapor line's are insulated with 3/8" sponge rubber.

STARTING ACCESSORY – For low voltage conditions.

FAN RELAY – (Required only when no electric heaters are needed)

ELECTRIC HEATER MODULE – Sequencers, temperature limit switches, fusible links and circuit breakers for safe, efficient operation.

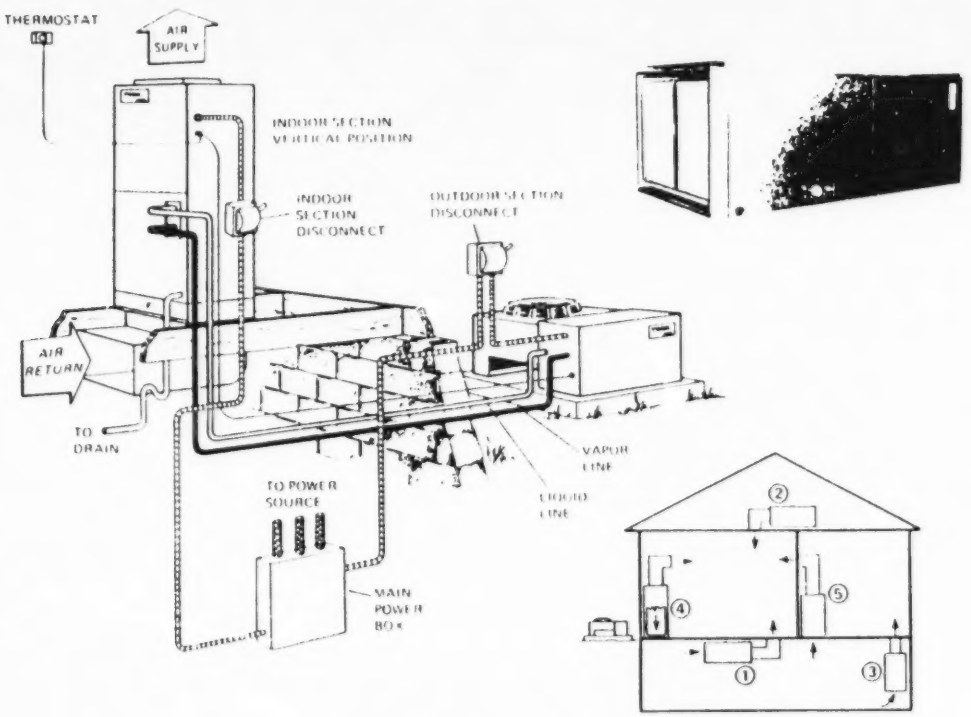
FILTER RACK – With permanent, cleanable type filters. Normally used for horizontal installation of indoor unit.

FILTER PLENUM – With permanent, cleanable type filters. Normally used for vertical installation of indoor unit.

SUSPENSION KIT – For mounting indoor unit in either horizontal or vertical positions.

THERMOSTAT – Exclusive design 24 volt, wall mount with emergency light and switch. Manual or automatic changeover. (Must be used with Champion Split System Heat Pump.)

TYPICAL WIRING AND PIPING—Champion Split System Heat Pumps



TYPICAL APPLICATIONS

① Horizontal Suspended	③ Upflow wall-mounted	⑤ Upflow-basement or crawl space return
② Horizontal (Attic or Crawl)	④ Upflow Plenum Return	

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APPENDIX "E"

INFORMATION TRANSFER

Local Store Will Be Aided To Save Energy

Five New Brunswick variety stores, one of them in Fredericyon, will be retrofitted with help from the federal government and the provincial Energy Secretariat.

In a press release, Natural Resources Minister Gerald Merrithew announced a joint provincial federal project costing $224,250 to retrofit the stores.

The federal Department of Energy, Mines and Resources will contribute $138,200, the Energy Secretariat will contribute $31,050, and the building owners will make up the rest. Each retrofit will cost about $26,000.

Maurice Robichaud of the Energy Secretariat said the five stores to be chosen for the project will be picked by the consultants undertaking the project, Enerplan Consultants Ltd. of Moncton.

The choice of the stores involved should be made within a month. The stores will be located in Fredericton, Moncton, Saint John, Campbellton and Bathurst.

"Substantial amounts of energy are consumed by the commercial sector," Mr. Merrithew said. "This retrofit project will demonstrate to commercial store owners and the general public, the economic potential of a well-planned energy retrofit.

"In addition, information resulting from these demonstration projects will aid in providing motivation to other store owners and the general public, to conserve energy through energy efficient retrofits."

Three main components of each building will be retrofitted: the building structure, mechanical heating/cooling systems and lighting.

Ceiling and wall insulation levels will be increased to a minimum of R-17. Different methods of upgrading insulation in commercial buildings will be used for comparison purposes. Doors and windows will be replaced or upgraded to current standards.

All mechanical systems will be modified with air to air heat pumps and heat recovery units among the systems to be installed in certain stores.

Where applicable gas-fired boilers will replace existing oil fired hot water boilers. Equipment will be selected to allow for simple conversions to natural gas in the future.

Both interior and exterior lighting systems will be retrofitted to demonstrate that lighting levels and power consumption can be reduced without sacrificing the quality of display lighting.

APPENDIX "F"

DETAILED CONSTRUCTION COSTS

BOLDEN'S VARIETY STORE

1.	Heat Pump System	$21,500.00
2.	Air Sealing	$ 2,400.00
3.	Entrance Doors	$ 2,427.20
	TOTAL	$26,327.20

LONG'S VARIETY STORE

1.	Insulation of exterior walls	$ 4,550.00
2.	Air leakage control work	$ 1,282.00
3.	Heat Pump System	$10,500.00
4.	Exterior lights	$ 480.00
5.	New electrical entrance	$ 1,500.00
6.	New doors and windows	$ 3,035.00
	TOTAL	$21,347.00

FIVE O'H'S VARIETY STORE

1.	Heat Pump System	$ 7,038.50
2.	Air Seal	$ 1,900.00
3.	Insulation	$ 3,195.00
4.	Siding	$ 1,072.00
5.	Wall repair	$ 231.00
6.	Entrance doors	$ 1,360.00
7.	Lighting and elctrical	$ 3,107.67
8.	Roofing	$ 4,852.00
9.	Fan and elctrical heater	$ 295.00
10.	Photocell on exterior lights	$ 60.00
11.	Exterior siding	$ 920.00
	TOTAL	$24,031.17

ELLIOTT BROTHERS LTD.

1. New siding and insulation		$11,000.00
2. New windows and door		$ 2,450.00
	TOTAL	$16,430.00

SUNSHINE FOODS LTD.

Heat Pump System	$12,399.00
Window removal and replacement by insulation vapor barrier, studs, plywood, Paint	$ 1,746.00
New doors and thermopane windows	$ 2,156.30
Windbreak at entrance,cement pad and wheel chair ramp	$ 1,000.00
Air sealing	$ 1,830.00
Exterior lighting c/w photcell	$ 1,650.00
TOTAL	$20,781.30